New England desmids of the sub-family Saccodermae

Joseph Augustine Cushman

The sub-family *Saccodermae* contains many of the least conspicuous of the desmids and also as a rule those which are apt to be overlooked, as is shown by the fact that previous to the writer's work on the New England species there were but fourteen species and varieties known from New England. In the present paper twenty-seven species and varieties are noted, for all of which New England specimens have been seen by the writer. While this doubles the number previously known, it is small when compared with the number known in the British Isles, fifty-seven species and varieties being recorded by W. & G. S. West in their recent monograph. In the genus *Spirotaenia* for instance, there are fourteen species recorded by the Wests from the British Isles, while from New England there are three (one up to the time of the present paper). This difference will probably be somewhat lessened with further collecting, especially in the White Mountain region where conditions are very favorable for certain forms.

In the preparation of the present paper material was examined from all of the New England states and such of the material of previous writers as is available. Material from Vermont and Connecticut has however been disappointing and not in any quantity. All the localities from which actual specimens have been seen by the writer are indicated by an exclamation point. Recent work has shown errors in the previous work and so far as known these are indicated in the brief synonymy given. The generic position is much changed from that in Wolle's Desmids of the United States, and his references are given whenever he has recorded the particular species. The forms new to the New England flora are marked by an asterisk.

In most points the monograph of the Wests has been followed. Free use has been made of their keys where they are given. At the end of the present paper is given a simple key to the New

England genera and species. While this is based upon the New England species actually seen, it nevertheless will largely apply to the northeastern United States.

Tribe GONATOZYGAE

GONATOZYGON DeBary. 1856

1. GONATOZYGON MONOTAENIUM DeBary, in Rabenh. Alg. *539*. 1856. — *G. Ralfsii* DeBary, Conj. 76. *pl. 4. f. 23–25*. 1858. — *G. asperum* Wolle, Desm. U. S. 22. *pl. 1. f. 1*. 1884.

Cells cylindrical, the apices slightly dilated; cell-wall usually with spinose granules.

Length 240–260 μ: breadth 10–22 μ.

Me.: (*W. West*). N. H.: Pudding pond, North Conway, rare! Holderness, scarce (*Wests*). Mass.: Carver's Pond, Bridgewater!

* **Gonatozygon monotaenium minutum** var. nov.

Variety very much smaller than the typical form of the species; other characters like the typical.

Length 59–68 μ: breadth in middle 6 μ: apices 7 μ.

Mass.: Winchester Reservoir, frequent (F. S. Collins Coll., Oct. 9, 1905)!

2. GONATOZYGON BRÉBISSONII DeBary, Conj. 77. *pl. 4. f. 26, 27*. 1858. — *G. asperum* Johnson, Bull. Torrey Club **22**: 291. *pl. 239. f. 8*. 1895.

Cells narrowly cylindric-subfusiform, the poles subcapitate; cell-wall densely granulate.

Length 112–160 μ: breadth 6–8 μ: apices 5.5–7 μ.

Me.: Scarbro' (*W. West*). N. H.: Laconia (*Wests*). Mass.: Reading!

3. GONATOZYGON PILOSUM Wolle, Bull. Torrey Club **9**: 27. *pl. 13. f. 16*. 1882. — Desm. U. S. 32. *pl. 1. f. 2*. 1884.

Cells elongate, cylindrical, usually not dilated at the apices; cell-wall clothed with small, straight, hair-like spines.

Length 390 μ: breadth 12.5 μ.

Mass.: Pondville! Conn.: Lamp Mortar Rock, Fairfield (*Wests*).

4. GONATOZYGON ACULEATUM Hastings, Am. Month. Micr. Jour. **13**: 29. 1892.

Cells cylindrical, the apices not at all or very slightly dilated; cell-wall clothed with long stiff spines.

Length 350 μ: breadth with spines 40 μ: without spines 20 μ.

N. H.: Pennichuck Pond, Nashua (*Hastings*). Meredith, occasional (*Johnson*). Laconia, frequent (*Wests*). Mass.: Plainville!

Tribe SPIROTAENIEAE

SPIROTAENIA Bréb. 1848

5. SPIROTAENIA CONDENSATA Bréb. in Ralfs, Brit. Desm. 179. *pl. 34. f. 1.* 1848. — Wolle, Desm. U. S. 33. *pl. 3. f. 21, 22.* 1884.

Cells cylindrical, the ends rounded, the length 7–10 times the width; a single broad, parietal, revolving chloroplast with eight to ten close revolutions.

Length 108–160 μ: breadth 15–20 μ.

Me.: Orono (*Harvey*). N. H.: Pudding Pond, North Conway! Mass.: South Framingham! Carver's Pond, Bridgewater! Gay Head, Marthas Vineyard! R. I.: Wainskut Pond, North Providence (*Bailey*). Conn.: Mill River, Fairfield (*Wests*).

* 6. SPIROTAENIA PARVULA Arch. Proc. Dubl. Nat. Hist. Soc. **3**[2]: 84. *pl. 2. f. 32–43.* 1863.

Cells small, the ends somewhat truncately rounded, 5–6 times as long as wide; a single very narrow chloroplast with slightly more than a single revolution.

Length 23 μ: breadth 4 μ.

Mass.: North Watuppa Lake, Fall River! New to North America.

* 7. **Spirotaenia obscura crassum** var. nov.

Cells fusiform, attenuated toward the poles, the apices rounded; chloroplast axile, cristate, with several ridges, making about one revolution: variety much smaller and comparatively shorter than the typical form.

Length 24 μ: breadth 10 μ.

Mass: South Framingham (May 1904)!

MESOTAENIUM Näg. 1849

* 8. MESOTAENIUM DEGREYI BREVE West, Jour. Linn. Soc. Bot. **29**: 131. *pl. 20. f. 6.* 1892.

Cells straight or slightly curved, 2½–3 times as long as wide. Length 58–66 μ: breadth 21–22 μ.

Mass.: Sphagnum material, North Watuppa Lake, Fall River (collected by S. N. F. Sanford, July 5, 1905)! New to North America.

9. MESOTAENIUM MACROCOCCUM (Kütz.) Roy & Bisset. *Palmogloea macrococca* Kütz. Phyc. Germ. 153. 1845. — *Mesotaenium macrococcum* Roy & Bisset, Ann. Scott. Nat. Hist. 1894. — *M. Braunii* Wolle, Desm. U. S. 31. *pl. 3. f. 5–9.* 1884.

Cells cylindrical, twice as long as wide, the apices truncately rounded; chloroplast an axile plate.

Length 38 μ: breadth 18 μ.

N. H.: From the Flume (*F. S. Collins*). Mass.: Lake Quinsigamond, Worcester (*Stone*). Gibb's Pond, Nantucket!

MESOTAENIUM MACROCOCCUM MICROCOCCUM (Kütz.) W. & G. S. West. *Palmogloea micrococca* Kütz. Bot. Zeitung **5**: 221. 1847. — *Mesotaenium micrococcum* Wolle, Desm. U. S. 32. *pl. 3. f. 10.* 1884.—*M. macrococcum micrococcum* W. & G. S. West, Bot. Trans. Yorks. Nat. Union **5**: 41. 1901.

Cells cylindrical, usually less than twice as long as wide, the apices rounded, slightly narrowed.

Length 15 μ: breadth 8.5 μ.

Mass.: Lake Quinsigamond, Worcester (*Stone*). Sandwich!

* 10. MESOTAENIUM CHLAMYDOSPORUM DeBary, Conj. 75. *pl. 7D.* 1858.

Cells oblong-cylindrical, 2-2½ times as long as wide, the apices broadly rounded; chloroplast a narrow axile plate.

Length 25 μ: breadth 11 μ.

Mass.: North Lake Watuppa, Fall River! New to the United States.

* MESOTAENIUM CHLAMYDOSPORUM MINOR W. &. G. S. West, Brit. Desm. **1**: 53. 1904.

Smaller than the typical form.

Length 18.5–21 μ: breadth 6.5–8.5 μ.

Mass.: South Framingham!

* 11. **Mesotaenium minimum** sp. nov.

Cells minute, 3 times as long as wide, the apices broadly rounded, imbedded in mucous masses; chloroplast an axile plate.

Length 14 μ: breadth 4.5 μ.

R. I.: Nyatt! (Collected by S. N. F. Sanford, July 2, 1905).

12. MESOTAENIUM ENDLICHERIANUM Näg. Gatt. Einzell. Algen 109. *pl. 6B.* 1849. — Wolle, Desm. U. S. 32. *pl. 3. f. 11.* 1884.

Cells cylindrical, about three times as long as wide, the apices broadly rounded; cells free-swimming; chloroplast an axile plate.

Length 25–31: breadth 8–10 μ.

N. H.: Intervale, frequent! Mass.: Lake Quinsigamond, Worcester (*Stone*). North Lake Watuppa, Fall River! Swansea!

CYLINDROCYSTIS Menegh. 1838

13. CYLINDROCYSTIS BRÉBISSONII Menegh. Accad. Sci. Torino, Mat. e Fis. II. **5**: 89. *pl. 12. f. 13.* 1843.—*Penium Brébissonii* Wolle, Desm. U. S. 36. *pl. 5. f. 7, 8.* 1884.

Cells cylindrical, 2½–3 times as long as wide, the apices rounded; chloroplast stellate with few large radiating processes.

Length 50–62 μ: breadth 17–18 μ.

Me.: Along Penobscot River, near Orono (*Harvey*). Mass.: Amherst (*W. West*). West Bridgewater! Tom Never's Pond, Nantucket!

CYLINDROCYSTIS BRÉBISSONII MINOR W. & G. S. West, Trans. Roy. Irish Acad. **32B**[1]: 20. *pl. 2. f, 7.* 1902.

Cells narrower and shorter than the typical form.

Length 28–32 μ: breadth 12–13 μ.

N. H.: Intervale! Mass.: Westport! Great Miox's Pond, Nantucket!

14. CYLINDROCYSTIS CRASSA DeBary, Conj. 37. 74. *pl. 7. f. C. 1–12.* 1828.—*Penium crassa* Wolle, Desm. U. S. 37. *pl. 5. f. 3.* 1884.

Cells oblong-cylindrical, twice as long as wide; chloroplast as in *C. Brébissonii.*

Length 40 μ: breadth 20 μ.

Me.: Orono (*W. West*). N. H.: Mt. Moosilauke! Mass.: Amherst (*W. West*).

15. CYLINDROCYSTIS AMERICANA MINOR Cushman, Rhodora **7**: 113. 1905.

Cells cylindrical, twice as long as wide, with broadly rounded apices, and a slight median constriction; each cell with a stellate chloroplast, smaller than the typical form.

Length 32–34 μ: breadth 16 μ.

N. H.: Mt. Moosilauke! Mass.: Sandwich!

16. CYLINDROCYSTIS DIPLOSPORA Lund. Nova Acta Reg. Soc. Sci. Upsala III. **8**: 83. *pl. 5. f. 7.* 1871.—*Calocylindrus diplospora* Wolle, Bull. Torrey Club **9**: 15. 1882.—Desm. U. S. 56. *pl. 12. f. 18.* 1884.

Cells subcylindrical, twice as long as wide, slightly broader toward the truncately rounded apices; chloroplasts with numerous radiating processes.

Length 60–61 μ: breadth 31–32 μ: isthmus 27–28 μ.

N. H.: Intervale! Mass.: Mt. Everett (*Wolle*).

* **Cylindrocystis diplospora minor** var. nov.

Cells like the typical but very much smaller.

Length 35–38 μ: breadth 16–18 μ: isthmus 14–15.5 μ.

Mass.: North Lake Watuppa, Fall River!

NETRIUM Näg. 1849

17. NETRIUM DIGITUS (Ehrenb.) Itzigs. & Rothe. *Closterium Digitus* Ehrenb. Phys. Abh. Akad. Wiss. Berlin **1830**: 68. 1832.—*Penium Digitus* Wolle, Desm. U. S. 34. *pl. 53. f. 1.* 1884.—*Netrium Digitus* Itizigs. & Rothe, in Rabenh. Alg. *508.* 1856.—*Penium lamellosum* Wolle, Desm. U. S. 34. *pl. 5. f. 4.* 1884.

Cells elliptical-oblong, gradually attenuated toward the apices which are rounded-truncate, three to four times as long as wide; chloroplasts axile with about six longitudinal plates, deeply notched at the outer margins.

Length 105–430 μ: breadth 34–105 μ: apices 14–45 μ.

Me.: Oldtown and Great Works (*Harvey*). Kittery, frequent! Bridgeton! N. H.: Saco Lake (*Wood*). Mt. Moosilauke, abundant! Pudding Pond, North Conway! Intervale! Mass.: Lake Quinsigamond, Worcester (*Stone*). Amherst (*W. West*). Tewksbury (*Lagerheim*)! Winchester Reservoir! Reading! Wellesley! Pondville! Plainville! Bridgewater! Halifax! Swansea! Fall River!

Sandwich! Marthas Vineyard! Nantucket! R. I.: Nyatt! Portsmouth! Wainskut Pond, North Providence (*Bailey*). Conn.: Bridgeport!

This seems to be the most abundant and widely distributed of the New England desmids, a representative gathering which does not include it being the exception. Its size is extremely variable as shown above.

*18. NETRIUM NAEGELII (Bréb.) W. & G. S. West. *Penium Naegelii* Bréb. in Pritchard, Infusoria 751. 1861. — *Netrium Nägelii* W. & G. S. West, Brit. Desm. **1**: 66. *pl. 7. f. 4, 5.* 1904.

Cells oblong-lanceolate, 4–5 times as long as wide, the apices truncately rounded; chloroplasts as in the preceding species.

Length 100–150 μ: breadth 24–28 μ.

Mass.: Plainville! North Watuppa Lake, Fall River!

This species, although a very cosmopolitan one, has not previously been reported from North America.

19. NETRIUM OBLONGUM (DeBary) Lütkem. *Penium oblongum* DeBary, Conj. 42, 73. *pl. 7G. f. 1. 2.* 1858. — *Netrium oblongum* Lütkem. Beitr. Biol. Pfl. **8**: 407. 1902.

Cells oblong-cylindrical, 3–3½ times as long as wide, the apices rounded; chloroplasts of the usual type, with six longitudinal plates.

Length 96 μ: breadth 29 μ.

N. H.: Intervale! Mass.: Amherst (*W. West*).

Wolle's figure of *Penium oblongum* is not this species, but represents a *Mesotaenium*, possibly *M. DeGreyi* Turn.

NETRIUM OBLONGUM CYLINDRICUM W. & G. S. West, Jour. Bot. **41**: 40. *pl. 446. f. 10.* 1903.

"Cells smaller than in the typical form and exactly cylindrical: apices hemispherical."

Length 60–71 μ: breadth 18–22 μ.

N. H.: Mt. Moosilauke!

NETRIUM OBLONGUM f. MAJOR (Turn.) Cushman, Rhodora **7**: 113. 1905.

Cells much larger than in the typical form of the species.

Length 168 μ: breadth 44 μ.

N. H.: Pudding Pond, North Conway!

20. NETRIUM INTERRUPTUM (Bréb.) Lütkem. *Penium interruptum* Bréb. in Ralfs, Brit. Desm. 151. *pl. 25. f. 4.* 1848. — Wolle, Desm. U. S. 35. *pl. 5. f. 14, 15.* 1884. — *Netrium interruptum* Lütkem. Beitr. Biol. Pfl. 8: 407. 1902.

Cells cylindrical, rapidly attenuate toward the obtusely rounded apices; chloroplasts four, two in each semicell, proximal ones in each semicell cylindrical, distal ones conical, each with eight longitudinal plates, the free margins of which are entire.

Length 172–320 μ: breadth 38–40 μ.

Me.: Oldtown and Great Works (*Harvey*). N. H.: Intervale! Mass.: Lake Quinsigamond, Worcester (*Stone*). Pondville! Bridgewater!

Key to the New England genera and species of Saccodermae

SACCODERMAE: Cell-wall unsegmented, without pores; point of division of cells not fixed, and unknown previous to the actual division.

Cells elongate, cylindrical, unconstricted in the middle, forming loose filaments; cell-wall granular or spinose; chloroplasts axile. (GONATOZYGAE.)
1. GONATOZYGON.

Cells solitary, relatively short and mostly unconstricted. (SPIROTAENIEAE.)

One chloroplast in each cell.

Chloroplast spirally twisted. 2. SPIROTAENIA.

Chloroplast plane, axile. 3. MESOTAENIUM.

Two chloroplasts (occasionally four) in each cell.

Chloroplasts star-shaped, radiating from a central pyrenoid. 4. CYLINDROCYSTIS.

Chloroplasts with longitudinal ridges, the edges of which are usually notched. 5. NETRIUM.

1. GONATOZYGON

Cell-wall densely granulate.

Cells cylindrical, the apices slightly dilated. 1. *G. monotaenium.*

Cells cylindrical-subfusiform, the apices subcapitate. 2. *G. Brébissonii.*

Cell-wall with small, short, straight, hair-like spines; cells not dilated at the apices. 3. *G. pilosum.*

Cell-wall with long, stiff, fairly stout spines. 4. *G. aculeatum.*

2. SPIROTAENIA

Chloroplast parietal, band-like.

Cells large, cylindrical; chloroplast broad, making 8–10 close revolutions. 5. *S. condensata.*

Cells minute, fusiform; chloroplast narrow, making about a single revolution. 6. *S. parvula.*

Chloroplast axile, cristate, with several ridges, making about a single revolution. 7. *S. obscura.*

3. MESOTAENIUM

Cells imbedded in mucilaginous masses.
- Cells large, often curved, 2½–3 times as long as wide, diameter 20 μ or more. 8. *M. DeGreyi.*
- Cells small, cylindrical, twice as long as wide, diameter 16–18 μ. 9. *M. macrococcum.*
- Cells small, cylindrical, 2–2½ times as long as wide, diameter 11–12 μ. 10. *M. chlamydosporum.*
- Cells minute, cylindrical, 3 times as long as wide, diameter 4–5 μ. 11. *M. minimum.*

Cells free-swimming, about 3 times as long as wide, the breadth 8–10 μ. 12. *M. Endlicherianum.*

4. CYLINDROCYSTIS

Cells unconstricted.
- Cells cylindrical, 2½–3 times as long as wide. 13. *C. Brébissonii.*
- Cells oblong-cylindrical, 1½–2 times as long as wide. 14. *C. crassa.*

Cells very slightly constricted.
- Cells slightly dilated toward the apices, which are truncately rounded. 15. *C. diplospora.*
- Cells not dilated toward the apices, which are broadly rounded. 16. *C. americana.*

5. NETRIUM

Cells with 2 chloroplasts, the edges notched.
- Cells elliptical-oblong, large, 3–4 times as long as wide, diameter usually more than 40 μ. 17. *N. Digitus*
- Cells oblong-lanceolate, of medium size, 4–5 times as long as wide, diameter usually about 30 μ. 18. *N. Naegelii.*
- Cells oblong-cylindrical, of medium size, 3–3½ times as long as wide, diameter usually about 30 μ. 19. *N. oblongum.*

Cells with 4 chloroplasts, the edges entire; ends of cells rapidly attenuated. 20. *N. interruptum.*

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